

*Full Length Research Paper*

# Transportation inefficiencies in the cocoa value chains in Ivory Coast: Is sustainability possible?

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**The purpose of this investigation is to examine transportation inefficiencies and the sustainability of cocoa value chains in Ivory Coast. Problems addressed include unidentified major actors, types of transportation and how it is measured, and lastly, improving efficiency in transportation with respect to society, costs and greenhouse gas emissions. A mixed method methodology is followed in which qualitative and quantitative data are gathered and analysed. Results show that the major actors are planters, cooperative management, exporters, ports, chocolatiers and supermarkets. The main forms of transportation are trucks and motorcycles and are measured using the United Nations criteria for sustainable transportation. The conclusion is that cocoa transportation in Ivory Coast is unsustainable. However, with the correct implementation of policy, financing and technological innovation, there is potential to improve the sustainability of cocoa transportation from farm gate to export harbour.**

**Key words:** Cocoa value chain, Ivory Coast, sustainability, transport.

## INTRODUCTION

The rationale of this research is to examine transportation inefficiencies and the limiting effect it may have on cocoa value chains in Ivory Coast, not creating competitive advantage and being unsustainable. Based on the results of the research, actionable recommendations are suggested to improve the sustainability of cocoa transportation from farm gate to export harbour.

The means of cocoa transportation in Ivory Coast are predominantly trucks and motorcycles. This choice of transportation method is due to the terrain and the available infrastructure. Data show that produce other than cocoa, such as coffee and rubber, are also transported in this manner. There is no railway system available for transporting produce. Although the Ivorian transportation system enables the country's cocoa value

chain to be the world's leading exporter of cocoa beans (Statista, 2020), it does not achieve a satisfactory level with regards to the factors affecting sustainable transportation of the produce set out by the United Nations. These factors are: safety, affordability, accessibility, efficiency, resilience and minimization of carbon and other emissions (United Nations, 2016).

This investigation addresses the following problems:

- (1) The different steps and lines of the cocoa value chains in Ivory Coast are not identified. This causes the major actors in the cocoa value chains to remain unknown.
- (2) The different types of transportation alongside the value chains in Ivory Coast are not identified. It is not

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known how sustainable transportation is measured or addressed.

(3) It is not known what the potential might be for improving efficiency in transportation with respect to society, costs and greenhouse gas emissions.

These problems could be solved by:

(1) Understanding cocoa value chains from production to the factory in Europe (considering raw material and semi-processed products separately)

(2) Characterizing transportation along several types of cocoa value chains and identifying inefficiencies

(3) Making actionable recommendations for the improved sustainability of cocoa transportation from farm gate to export harbour

The problems show that the future of sustainable cocoa in Ivory Coast is under threat because of inefficiencies in transportation and cocoa value chains being complex and characterized by trade imbalances and asymmetric information. Although the International Cocoa Organization emphasizes improving production, industry, consumption and management along the cocoa value chain (ICCO, 2018), there is an information gap in improving the sustainable transportation of cocoa beans from farm gate to export harbour in Ivory Coast, the world's leading exporter of cocoa beans. Based on an exchange with the leadership of the Maximising Opportunities in Cocoa Activity (MOCA) project based in Ivory Coast, it was suggested that this study focuses on the area from Soubré to San-Pédro, with Soubré being referred to as "at the heart of the cocoa belt" (Reuters, 2018) and the region of San-Pédro accounting for 9.5 to 12.7% of the total cocoa production in Ivory Coast (Oxford Business Group, 2017).

## RESEARCH METHODS

In order to determine the current state of research that is available on the subject of transportation inefficiencies in the cocoa value chains in Ivory Coast from farm gate to export harbour, more than five specialist databases are consulted to compile a relevant literature review. These databases include AGRICOLA, AGRIS, CAB Abstracts, Food Science and Technology Abstracts, and Web of Science. Companies that are trading in cocoa in Ivory Coast and Europe, non-governmental organisations, foundations, associations, federations and research institutions were researched and selectively contacted. Websites were scanned for content with a specific focus on sustainable transportation along the cocoa value chain, specifically within Ivory Coast from farm gate to export harbour. The literature review preceded field research during which data are collected to fully answer the research questions. Three major factors are taken into consideration for the field research. These factors are policy development and implementation, financing, and technological innovation (Allenbach, 2014; United Nations, 2016).

A mixed method methodology is followed in which qualitative and quantitative data are gathered, based on a 57-question questionnaire and in-depth interviews with key stakeholders. The

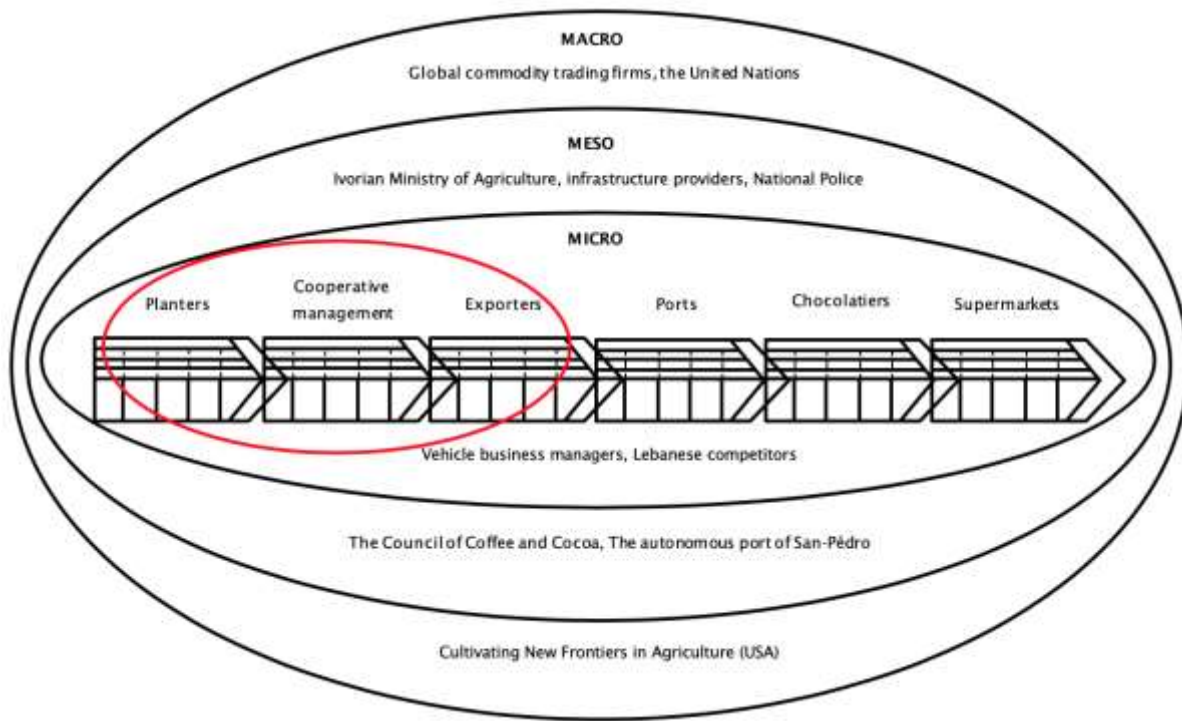
six-question in-depth interview is completed by 15 respondents. The 57 question-questionnaire was completed by 138 respondents. Collaborators included two cooperatives: Société Coopérative des Planteurs d'Iratéké (SOCOOPI) and Société Coopérative Agricole Badéya Soubré (SOCOOABAS). Three villages provided their views: Konédougou, Djihimbo, and Iratéké. Special function actors from the Soubré, Grand-Béréby and San-Pédro triangle also participated. The major actors questioned include transporters ("pisteurs", truck drivers, motorcycle drivers, bicycle drivers, car drivers), the management of cooperatives and management of transportation, farmers, vehicle owners, collection point owners and managers, local government and municipality, local traders, exporters, and society (that is, family of cocoa value chain contributors). The grouping of the questions follows the 5 I's and the 5 C's of the UN paper on mobilizing for sustainable transportation. These I's and C's are infrastructure, innovation, integration of modes, intelligence (capacity building and training), investment, client, centres (logistic hubs), corridors, congestion (pollution and efficiency), and complementarity (multimodal transportation). The compatibility of current transportation practices with the sustainable development goals (SDG) are looked at, using the SDG dashboard. In addition to the UN paper on Sustainable Transportation, the carbon footprint calculator presented by myclimate (myclimate, 2018) was also used.

## RESULTS AND DISCUSSION

A detailed understanding of the cocoa value chains of raw materials (cocoa beans) is gleaned from the literature and from data collection in Ivory Coast. The different steps and lines of specifically raw materials, and not of semi-processed products, are analysed.

The approach to understanding the "steps and lines" of the cocoa value chains is to see each arrow in Figure 1 as representing one "step" (Porter, 2008). The steps (arrows) flow horizontally and sequentially. An example of a horizontal activity is the transfer of cocoa beans from cooperative to exporter at the factory close to the port (in Africa). The "lines" (both dashed and full) that divide each value chain into columns (Figure 1), represent the "lines" in "steps and lines". These lines (columns) flow vertically. An example of a vertical activity is planting, harvesting, fermenting and drying of the cocoa beans and their UTZ-certification training in the "planters" value chain.

Transposing this understanding to a business enabling environment perspective, Figure 1 is an idealised depiction of the complexity of cocoa value chains in Ivory Coast and globally. The focus is still on the phenomenon of the physical movement of the cocoa beans in the enabling environment. This illustration simply takes the bird's eye view of the global value chains of cocoa, starting from Ivory Coast. The macro environment encompasses larger entities such as global commodity trading firms, the United Nations, and the NGO named Cultivating New Frontiers in Agriculture (based in the USA). These entities have an impact on the cocoa value chain in Ivory Coast itself, but this only represents one of many other portfolio activities and sectors of theirs. The meso environment includes medium-sized actors such as the Ivorian Ministry of Agriculture, infrastructure



**Figure 1.** Idealised depiction of the complexity of cocoa value chains in Ivory Coast.

providers, the National Police, the Council of Coffee and Cocoa, and the autonomous port of San-Pédro. These meso entities play an important role in the cocoa value chains but also engage in other semi-related activities. The microenvironment incorporates actors such as vehicle business managers, and cocoa procurement competitors, in this case such as Lebanese firms. These entities work closely with and against the major actors that compose the backbone of the cocoa value chains.

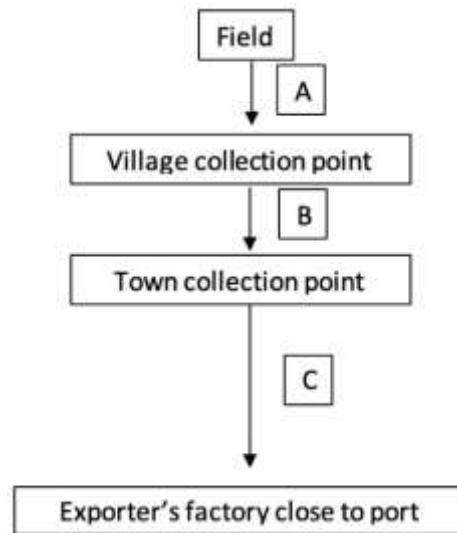
Data in this study show that transportation limits the value chain from planters to exporters due to its unsustainability in its current form. The ideal would have been that transportation enhances the value chain in that the produce can be shifted from one actor to the next, allowing each actor to deliver maximum value for the least possible cost (Tardi, 2020). From the perspective of this investigation, the major actors that form the backbone of the global cocoa value chains are planters, cooperative management, exporters, ports, chocolatiers and supermarkets. This sector is indicated by the red oval in Figure 1.

The types of transportation alongside the value chains in Ivory Coast are grouped by the segment of the journey. Within the borders of the Ivory Coast, the journey of each cocoa bean roughly follows three segments, herein named “A”, “B” and “C”. The shortest segment, A, takes place between the planter’s field and the village collection centre. This segment is often completely inaccessible by vehicles apart from motorcycles. Trails are a common

occurrence. There are no tarred or profiled roads in general. The second segment, B, stretches from village collection point to town collection point. It is the second longest segment and takes the product away from the village through “the bush”. Roads on these segments may at times be profiled but in general they are dirt roads accessible at most by three to five-tonne trucks. These roads become completely blocked off during times of rain. The third and final segment, C, takes place from the town collection point to the exporter’s factory close to the port. It is composed of a mix of tarred and dirt roads. For certain stretches, these roads are in good condition but in general there is a significant disparity in the quality of these roads as compared to European roads. The chief problem being the number and severity of the potholes. Figure 2 depicts the three segments. What follows is the characterisation of different types of transportation used along each segment. The survey data for Figure 2 were gathered during in-depth interviews with planters and cooperative management.

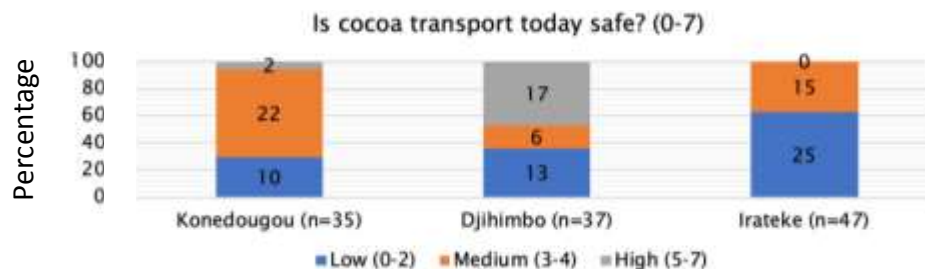
The United Nations has set targets and goals of measuring sustainable transportation according to the criteria of safety, affordability, accessibility, efficiency, resilience and minimization of carbon and other emissions (United Nations, 2016). These criteria correspond with specific Sustainable Development Goals.

These criteria are used to determine planters’ opinion on the standard of sustainable transportation of cocoa in Ivory Coast. The six figures illustrate the relative



**Figure 2.** Depiction of segments “A”, “B” and “C”.

Source: Human (2018).



**Figure 3.** Planters' opinion on safety.

Source: Djihimbo Village Planters and SOCOOPI (2018); Iratéké Village Planters and SOCOOPI (2018); Konédougou Village Planters and SOCOOABAS (2018).

frequencies of planters' answers to the questions on the safety, affordability, accessibility, efficiency, resilience and minimization of carbon and other emissions in transportation. The data is stratified by village and responses to the questions are described in terms of “low”, “medium” or “high”. Answers numbered 0, 1 or 2 are categorised as “low”; 3 or 4 is categorised as “medium”; 5, 6 or 7 as “high”. For example, a respondent with the answer of “1” out of “7” has as a low perception of the safety of transportation in this case and therefore a “low” score.

### Safety criteria

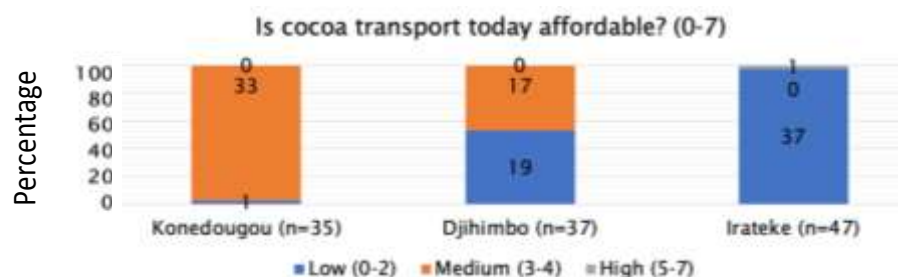
- (1) Number of deaths and injuries from road traffic accidents
- (2) Deaths and illnesses from pollution (from SDG 3: good health and well-being) (United Nations, 2016: 11).

Iratéké shows the most important proportion of “low” (25 out of 47) and “medium” (15 out of 47) responses, with no “high” responses. Konédougou also reveals far “lower” (10 out of 35) and “medium” (22 out of 35) responses than “high” (2 out of 35) responses. Djihimbo divulge a unique and important share of “high” (17 out of 35) responses, but also show a share of “low” (13 out of 35) responses (Figure 3).

### Affordability criteria

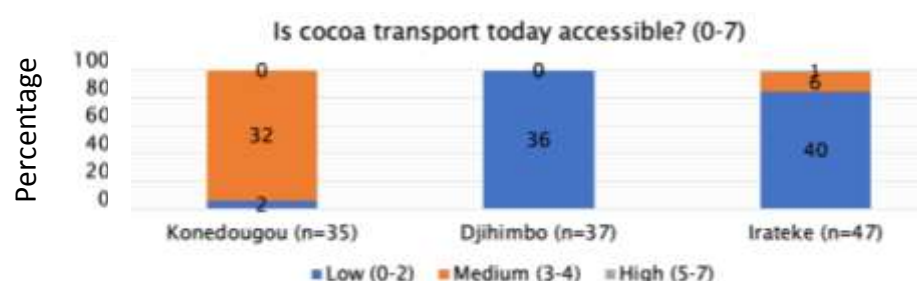
- (1) Budget friendliness of vehicle ownership given the planters' monthly salaries (SDG 3: Good health and well-being) (adapted from United Nations, 2016: 11).

Iratéké shows the largest share of “low” responses (37 out of 47). One outlier in Iratéké responds “high”. Djihimbo uncovers an even spread of “low” (19 out of 37)



**Figure 4.** Planters' opinion on affordability.

Source: Djihimbo Village Planters and SOCOOPI (2018); Iratéké Village Planters and SOCOOPI (2018); Konédougou Village Planters and SOCOOABAS (2018).



**Figure 5.** Planters' opinion on accessibility.

Source: Djihimbo Village Planters and SOCOOPI (2018); Iratéké Village Planters and SOCOOPI (2018); Konédougou Village Planters and SOCOOABAS (2018).

and “medium” (17 out of 37) responses with no “high” response. Konédougou reveals a large share of “medium” responses (33 out of 35) (Figure 4).

### Accessibility criteria

(1) Agricultural productivity and incomes of small-scale food producers (access to markets) (from SDG 2: Zero hunger) (United Nations, 2016: 11).

Djihimbo shows the most concentrated share of “low” responses (36 out of 37). Iratéké shows an important share of “low” responses (40 out of 47). Konédougou shows a strong share of “medium” responses (32 out of 35). Both Konédougou and Djihimbo show no “high” responses (out of a possible 72) (Figure 5).

### Efficiency criteria

(1) Rate of improvement in energy efficiency (SDG 7: affordable and clean energy)  
 (2) Rationalize in-efficient fossil-fuel subsidies (SDG 12: responsible production and consumption) (United Nations, 2016: 11).

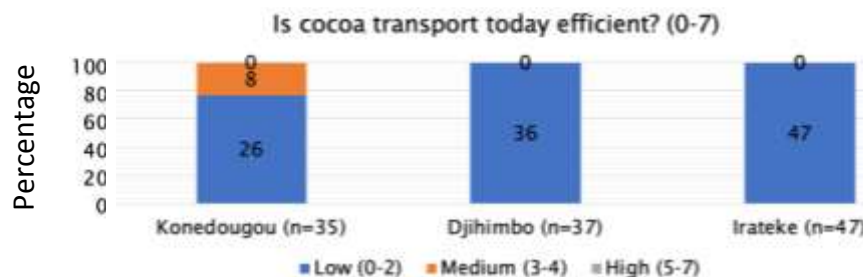
Iratéké and Djihimbo's results show overwhelmingly that cocoa transportation is inefficient (47 out of 47 and 36 out of 37, respectively). Konédougou's results show a high number of “low” responses (26 out of 35) and a weaker but significant share of “medium” responses (8 out of 35), meaning that only eight people think that cocoa transportation is efficient to a certain degree. In all three villages, there are no “high” responses (out of a possible 119) (Figure 6).

### Resilience criteria

(1) Development of sustainable and resilient infrastructure (SDG 9: Industry, innovation and infrastructure)  
 (2) Strengthen resilience (SDG 13: Climate action) (United Nations, 2016: 11).

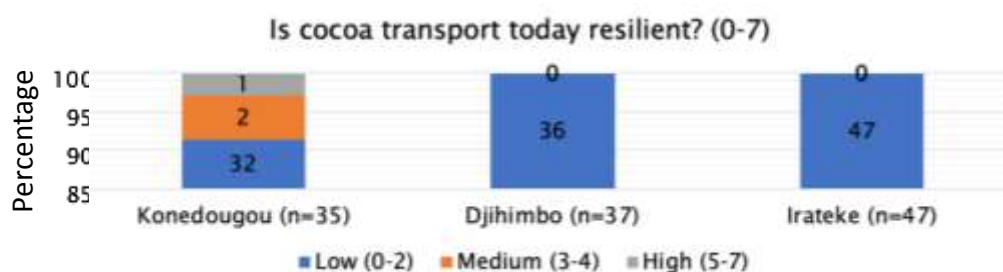
All respondents of Iratéké respond “low” (47 out of 47). Nearly all respondents of Djihimbo respond “low” (36 out of 37). Konédougou mostly respond “low” (32 out of 35) with one outlier responding “high” (1 out of 37). These quantitative results concur with the following associated qualitative data: Konédougou's respondents suggest that regular road reprofiling, bridges, sufficient trucks and machines to improve cocoa bean quality would improve





**Figure 6.** Planters' opinion on efficiency.

Source: Djihimbo Village Planters and SOCOOPI (2018); Iratéké Village Planters and SOCOOPI (2018); Konédougou Village Planters and SOCOOABAS (2018).



**Figure 7.** Planters' opinion on resilience.

Source: Djihimbo Village Planters and SOCOOPI (2018); Iratéké Village Planters and SOCOOPI (2018); Konédougou Village Planters and SOCOOABAS (2018).

the situation (Konédougou Village Planters and SOCOOABAS, 2018) (Figure 7). In Djihimbo, respondents suggest the following: replace motorcycles every two years, build an extra village collection point, assign an extra manager at said extra collection point, send a truck (Djihimbo Village Planters and SOCOOPI, personal communication, 10 July 2018). In Iratéké, respondents suggest: renew and repair the motorcycles, send more motorcycles for the fields inaccessible by truck, send an extra 3 to 4-tonne truck, and renovate the village road (Iratéké Village Planters and SOCOOPI, 2018).

### Minimizing carbon and other emissions and environmental impact criteria

- (1) Integrate climate change measures into national plans (SDG 13: Climate action)
- (2) Provide access to safe, affordable, accessible and sustainable transportation systems for all (SDG 11: Sustainable cities and communities)
- (3) Reduce the adverse environmental impact of cities (SDG 11) (United Nations, 2016: 11).

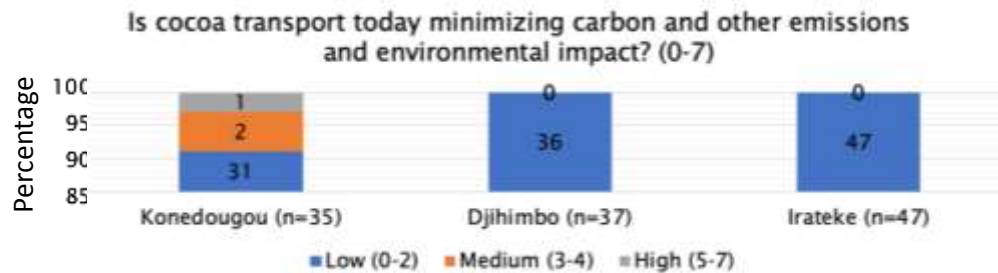
All respondents in Iratéké answer “low” (47 out of 47) (Figure 8). All but one respondent in Djihimbo answer “low” (36 out of 37). The majority of respondents in

Konédougou answer “low” (31 out of 35) with one outlier answering “high” (1 out of 35).

The data show that all three villages studied score low across the factors of safety, affordability, accessibility, efficiency, resilience and minimizing carbon and other emissions. This confirms the need to improve the sustainability of cocoa transportation from farm gate to export harbour. Suggested programmes that could help improve the scores across the factors could include: build more collection points at strategic locations, invest in better roads on segments A, B and C, invest in better vehicles, replace “pisteurs” with formal actors, open bank branches close to town collection points and develop a sustainable national railway system.

There is consensus among respondents, both planters and special function actors, that “nothing” is done to address the problem of sustainable transportation presently (Cyprien et al., 2018; Djihimbo Village Planters and SOCOOPI, personal communication, 10 July 2018; Iratéké Village Planters and SOCOOPI, personal communication, 10 July 2018; Konédougou Village Planters and SOCOOABAS, personal communication, 10 April 2018).

Certain respondents point towards the state-run coffee and cocoa council to find a solution (Diabaté, 2018). Others suggest that it would be beneficial if entrepreneurs concerned themselves with sustainable transportation



**Figure 8.** Planters' opinion on minimizing carbon and other emissions and environmental impact.  
 Source: Djihimbo Village Planters and SOCOOPI (2018); Iratéké Village Planters and SOCOOPI (2018); Konédougou Village Planters and SOCOOABAS (2018).

in their own systems (Ohouo et al., 2018). They add that the state popularizes the concept of sustainable transportation in several agricultural value chains in Ivory Coast. According to certain cooperative managers, XOF 5 per kg of cocoa is used to improve the state of roads and trails. The problem in Africa, however, is corruption. Elected officials are accused of finding ways to benefit only themselves.

Vehicle business managers assert that the road is the most important problem to resolve. The state is encouraged to make every effort to improve the roads leading into the bush; to work with the mayors of those regions. It is proposed that next, sufficient trucks are sent to more easily transport the mass of available Ivorian cocoa beans. The price to purchase a 3 to 5-tonne truck is XOF 8,500,000 = CHF 14,800. The problem with increasing the fleet of trucks is financing. Confidence of credit is important. Smaller banks like Orabank may well be willing to finance but older banks already have the clientele they need.

The vehicle business owner has a track record with cooperative managers so that they can grant favourable credit. The Lebanese also work with the vehicle business owner! Competition for the vehicle business owner are two similar shops nearby. The Lebanese sometimes operate up to 20 shops at a time. In Abidjan, where firms work exclusively with cash as opposed to credit, there are three to five competitors (Diallo, 2018).

Responses from the three villages Konédougou, Djihimbo and Iratéké describe the potential for improving efficiency in transportation with respect to society, costs and greenhouse gas emissions.

In terms of society, Konédougou sees the potential as improved living conditions, better employment rates, increased production levels, reduced transportation times and reduced transportation costs. Djihimbo foresees potential as better health services access, faster product evacuation and longer vehicle life. Special function actors see potential as no fictitious cooperatives, higher salaries, improved water access, win-wins, improved food access, guaranteed education and improved social connectivity. In terms of costs, Konédougou anticipate potential as

reduced food costs, reduced school access costs, reduced health-related costs, reduced fuel consumption costs, and reduced reparations costs. Djihimbo sees potential as less frequent vehicle renewal, reduced fuel costs and reduced maintenance costs. Special function actors see potential as reduced reparations costs and increased market confidence. In terms of greenhouse gas emissions, Konédougou anticipate improved public health. Djihimbo and Iratéké see less emissions. Special function actors anticipate less emissions, improved public health and better-quality fuel.

The global indicator framework for the SDGs is used as secondary data (United Nations, 2018). In this framework, Sustainable Development Goals are presented with corresponding indicators (Table 1).

The inference can be made that there is a link between these responses and the indicators of the SDGs. This means that if the potential voiced by the respondents is reached, they would by definition contribute to the achievement of the corresponding SDGs. This is true across potential for society, costs and greenhouse gas emissions. The corresponding society-related SDGs include goals 3, 8 and 11. Those relating to costs include SDGs 2, 4, 8 and 12, and for greenhouse gas emissions, 1 and 13.

## Conclusions

This investigation shows that inefficiencies in the cocoa value chains in Ivory Coast from farm gate to export harbour cause transportation to be unsustainable.

The first problem of unidentified steps and lines of the cocoa value chains and major actors to be unknown was solved by showing that the cocoa value chains function within a combined micro, meso and macro business enabling environment. The microenvironment holds the cocoa value chain that is the focus of this study. The steps of the cocoa value chains in Ivory Coast flow horizontally and sequentially. Planters, cooperative management, exporters, ports, chocolatiers, and supermarkets are the major actors in the different steps

**Table 1.** The potential for improving efficiency in transportation with respect to society, costs and greenhouse gas emissions

|                         |                                  |                               |    |                                |    |                        |    |
|-------------------------|----------------------------------|-------------------------------|----|--------------------------------|----|------------------------|----|
| Planters                | Konédougou village               | Improved living conditions    | 3  | Reduced food costs             | 2  | Improved public health | 11 |
|                         |                                  | Better employment rate        | 8  | Reduced school access costs    | 4  | -                      | -  |
|                         |                                  | Increased production levels   | 8  | Reduced health-related costs   | 8  | -                      | -  |
|                         |                                  | Reduced transport times       | 11 | Reduced fuel consumption costs | 12 | -                      | -  |
|                         |                                  | Reduced transport costs       | 11 | Reduced reparations costs      | 12 | -                      | -  |
|                         | Djihimbo village                 | Better health services access | 3  | Less frequent vehicle renewal  | 8  | Reduced emissions      | 13 |
|                         |                                  | Faster product evacuation     | 11 | Reduced fuel costs             | 12 | -                      | -  |
|                         |                                  | Longer vehicle life           | 11 | Reduced maintenance costs      | 12 | -                      | -  |
|                         | Iratéké village                  | NA                            | NA | NA                             | NA | Reduced emissions      | 13 |
|                         | Ministry of Agriculture          | No fictitious cooperatives    | 1  | Reduced reparations costs      | 12 | Reduced emissions      | 13 |
| Special function actors | Union of cooperatives management | Higher salaries               | 1  | NA                             | NA | NA                     | NA |
|                         | Cooperative management           | Improved water access         | 2  | NA                             | NA | Improved public health | 11 |
|                         |                                  |                               |    |                                |    | Reduced emissions      | 13 |
|                         | 40-tonne truck driver            | Everybody wins                | 17 | NA                             | NA | Reduced emissions      | 13 |
|                         |                                  | Improved food access          | 2  | Increased market confidence    | 8  | Better quality fuel    | 13 |
|                         | National Police                  | Guaranteed education          | 4  | -                              | -  | -                      | -  |
|                         |                                  | Improved social connectivity  | 11 | -                              | -  | -                      | -  |

of the cocoa value chains with each actor also having its own value chain. The lines that these actors engage in flow vertically and are called primary and support activities. These lines serve the purpose of achieving competitive advantage. The microenvironment is surrounded by the meso environment including medium-sized actors and the macro environment, in turn, surrounds the meso environment including larger entities.

The second problem of unidentified types of transportation alongside the value chains in Ivory Coast and whether sustainable transportation is measured or addressed was solved through results showing that trucks and motorcycles are the dominant forms of transportation from farm

gate to export harbour. Significantly, there is no railway system that could efficiently be used in the cocoa value chain. Transportation inefficiencies include insufficient village collection points, blocked roads during rain due to lack of profiling and tar, excessive reparations costs due to potholes and low-quality roads, excessive pollution caused by trucks, “pisteurs” lowering the value chains’ credibility, and a lack of bank branches at junctions where trading takes place. Sustainable transportation is measured using the United Nation’s criteria of which the results show that transportation is mostly unsafe, unaffordable, inaccessible, inefficient, not resilient and that the emission of carbon and other gases are not

sufficiently minimised.

The third problem of not knowing what the potential might be for improving efficiency in transportation with respect to society, costs and greenhouse gas emissions was solved through actionable recommendations.

## RECOMMENDATIONS

These recommendations are based on an analysis and application of policy recommendations from the United Nations on advancing sustainable transportation (United Nations, 2016). Recommendations are categorised under (a) Policy



development and implementation, (b) financing, and (c) technological innovation.

The goal of the recommendations for this investigation is to provide realistic proposals to make transportation from the farm gate to the export harbour in Ivory Coast more sustainable.

### Policy development and implementation

(1) Address primary and support activities by facilitating multi-stakeholder engagement and encouraging multi-sector action. First, all relevant state and non-state actors should be invited to participate in discussions on the governance of value chains. The goal would be to propose synergistic governance in which private, social and public role players participate in order for cocoa value chains to achieve competitive advantage while keeping the social, environmental and economic dimensions in mind.

(2) Develop and implement policy that would allow for equitable access and reward all workers and stakeholders, regardless of gender. Combat discriminatory or unsound labour practices. Minimize travel disruptions, by better planning of where village collection points should be, to decrease travel time and cost for workers.

(3) At government level, consider and develop action plans to minimizing carbon and other emissions.

(4) Develop and implement programmes to create awareness for the achievement of all the SDGs, specifically those SDGs to which the respondents need to be made aware of. These are SDGs 5, 10 and 17, relating to gender equality, reduced inequalities (empowering low-income earners), and the forming of partnerships to achieve the SDGs.

(5) Replace “pisteurs” with formal actors.

### Financing

(1) Mobilise funding for investing in the development of infrastructure: roads and vehicles.

(2) Open more bank branches where trading takes place.

### Technological innovation

(1) Strengthen available infrastructure - roads and vehicles - that would ultimately lead to improved-quality cocoa beans;

(2) Develop a sustainable national railway system that accommodates the cocoa value chain;

(3) Provide access to appropriate frameworks such as the “Mobilising Sustainable Transportation analysis and policy to relevant actors” (United Nations, 2016), in electronic or hard copy formats.

In conclusion, in its current form, cocoa transportation in Ivory Coast is unsustainable. With the correct

implementation of suggested actionable recommendations, there is significant potential to improve the sustainability of cocoa transportation from farm gate to export harbour.

### CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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